Resume

Personal information

Name: Dr. Joan Elizabeth Thomas

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129 Colonels Way
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Family:
Husband and 2 adult daughters.

Academic Qualifications

- Doctor of Philosophy (applied science) (1999); University of South Australia
- Graduate Diploma in Education (secondary science) (1972); Flinders University of South Australia
- Bachelor of Science (Honours) (1971); Flinders University of South Australia. (The honours thesis research was in crystallography involving compounds of biological interest).
- Bachelor of Science (1970); Flinders University of South Australia. (Majors for the bachelor degree were in Physical Chemistry and Inorganic Chemistry).

Present position

- Research Scientist within the Free Electron Laser group at Jefferson Lab March 2005 – present.
- Associate Visiting Scientist at the College of William and Mary, in the Department of Applied Science.

My duties include

- Collaboration within a small group of applied scientists working to establish a national centre for Sum Frequency Generation Spectroscopy at Jefferson laboratory (using the unique possibilities of the radiation from the Free Electron laser). The initial stage involves establishing a body of work with existing FTIR equipment.
- Surface science in organic geochemistry; study of the adsorption of organic molecules (typically found in natural organic matter) on to minerals.

Positions within the University of South Australia

- Research Fellow in the Ian Wark Research Institute, January 2003 – March 2004.
- Research Associate in the Ian Wark Research Institute, August 1999- 2002.
- Research Assistant in the Ian Wark Research Institute, July 1998 – August 1999.
- Lecturer A (casual), School of Chemical Technology, February 1993 – December 1994.
- Tutor / Lecturer A (part-time contracts), School of Sciences, Salisbury Campus, January 1987 – December 1992.

My duties at the University of South Australia included;

- Advisor to Rio Tinto regarding associated projects at the Bundoora, Victoria, Australia, laboratories.
- Designing and carrying out experiments.
- Interpretation of experimental results.
- Project management on a day to day basis.
- Preparing written reports and seminars for industrial sponsors.
- Presenting at national and international conferences.
- Publishing in scholarly journals.
- Liaising with research partners and sponsors both within the IWRI and interstate.
- Associate supervisor of 3 successful PH D students.
- Assisting in the preparation of grant applications.
- As a member of the 'Human Bio-Science' planning team, I assisted in establishing the initial course content in the area of physical sciences for the Bachelor of Nursing program at the University of South Australia;
    - Preparation and presentation of lectures on 'The principles of radiation for medical purposes'.
    - Preparation and running of interactive workshops and tutorials relating to the physical sciences.

- In the Bachelor of Education (Secondary Science) program I was involved with;
    - Lecture and tutorial preparation and presentation (including sole responsibility for the second year subject 'Inorganic chemistry').
    - Supervision of laboratory classes.
    - Supervision of Bachelor of Education students during placement in schools.
    - The planning and preparation of science material for primary school students.

Career prior to work at the University of South Australia

Secondary school science and mathematics teacher; Adelaide, South Australia (1972-1973) and Vancouver, Canada (1976-1982).
Research assistant in the Department of Soil Science, University of British Columbia, Canada (1974-1975).

Research

Grants Held

In 2002, I became a chief investigator on two successful ARC Linkage Grants with total funding of over $1.2 million.

'The recovery of Cu from chalcopyrite-pyrite containing concentrates, ores and tailings' 2002 – 2006.

Chief Investigators; Assoc. Prof. A. Gerson, Dr. J. E. Thomas, Mr F. L. Peddie, Dr. R. W. Shaw and Ms. L. Esdaile,
Total funding;

- ARC - $263,895
- Industry sponsor (Trading on Technology Resources Pty Ltd) - $327,088

This project follows on from the project 'Surface layer control for the improved copper recovery from chalcopyrite leaching' that ran for 3 years (1999-2001). The projects is again sponsored by 'Trading on Technology Resources Pty Ltd', a company associated with Rio Tinto. Both projects involve applying surface analysis techniques (SEM, XPS and ToF-SIMS) to investigate the nature of the dissolving chalcopyrite surface. The new project continues the investigation of chemical leaching and extends the investigation to bacterial leaching.

'Neutralising mineral reactions in acid mine drainage control' 2002 – 2004.

Chief Investigators Prof. R. St.C. Smart, Dr. J.E. Thomas, Dr. S.D. Miller and Dr. R.C. Schumann**.**

Total funding**;**

- ARC – $320,000
- Industrial sponsor AMIRA International $317,000

The project 'Neutralising mineral reactions in acid mine drainage control' has a group of mining industry sponsors including Rio Tinto Ltd., PT Freeport Indonesia Ltd., Newcrest Australia Ltd. and BHP Billiton. The Industry sponsorship is coordinated by AMIRA (Australian Minerals Industries Research Association). This project follows the completion of the project P387A 'The prediction and kinetic control of acid mine drainage' which ran from July 1998 - 2001. These projects involve collaboration with Environmental Geochemistry International Pty Ltd. (Sydney) and Levay and Co. (Mawson Lakes).

Research Career Summary

Research in applied science with the Free Electron Laser Division at Jefferson Lab., Virginia, USA, has been present in poster form at the 18th World Congress of Soil Science,

Doctoral studies at the University of South Australia were completed part time over a period of six years, after a gap of 20 years since previous formal studies. In the years since the awarding of my Ph.D., I have been engaged in full time employment in research areas flowing from my skills developed during doctoral studies. Major scientific contributions have been made to reports confidential to sponsors (9 in the area of acid rock drainage and 4 in the area of chalcopyrite leaching) and numerous sponsors meetings.

I have made significant contributions to the understanding of testing methods used by industry for estimating net acid generation of mine waste material containing pyrite and other metal sulfides. Categorisation of sponsors' waste rock and tailings has been greatly improved through the removal of a number of uncertainties in the predictive testing. Successful trials were also conducted on a method of speeding pyrite oxidation by the application of potential to pyrite in a waste assemblage. Such a method could be of considerable interest if combined with cathodic treatment of resulting solutions for metal recovery.

Research results from the project 'Surface layer control for the improved copper recovery from chalcopyrite leaching' have lead to the formulation of a reaction mechanism by combining the elements of experimental and modelling work done by the IWRI team with that of complimentary work in the literature. The success of the work is such that publication has not been possible.

A survey of my 'Citation Index' shows I have been cited by authors having a world wide distribution including China, France, Russia, Romania and Switzerland

Knowledge Application

- AMIRA International has published an 'ARD Test Handbook'. This book contains protocols for the assessment of potential acid rock drainage from materials (such as mine waste). The information has been complied for the use of the minerals industry as a result of the P387A-B projects, 'Prediction and control of acid mine drainage'.
- Team member for the workshop 'ARD Prediction: Protocols and Guidelines for Classifying the Acid Forming Characteristics and Evaluating ARD Kinetics of Mine waste Material' to be held in conjunction with the 6th International Conference on Acid rock Drainage to be held in Cairns Australia 12- 18 July. This is intended for people based on site in the mining industry.
- The research project 'Surface layer control for the improved copper recovery from chalcopyrite leaching' has led to a world wide patent, WO03038137, on which I have been named.
- Refereed a journal articles submitted to the journals 'International Journal of Mineral Processing' and "Applied Geochemistry'.

Other professional and service activities

- Royal Australian Chemical Institute (RACI), member (since 1987).
- RACI (SA Branch) committee member 2003 (industrial chemistry representative).
- RACI (SA Branch) representative at an Environmental Protection Agency 'Round Table' in June 2002.
- Salisbury Women's Advisory Group; founding and core member.
- Women's Advisory Group of the Research and International portfolio; attend regular meetings.
- Member of Science in Nurse Education (SINE), 1990-1992.

Publications

Research

Books

Ian Wark Research Institute and Environmental Geochemistry International: 2005 ARD Test Handbook. AMIRA P387A-B Projects; Prediction and Kinetic Control of Acid Mine Drainage. AMIRA International, Melbourne, Australia, www.amira.com.au

Refereed Journal Articles

Gerson A.R. and Thomas J.E. *The influence of chalcopyrite on the acid dissolution behaviour of pyrite.* Geochimica et Cosmochimica (2006 submitted)

Harmer S., Thomas J. E., Fornasiero D. and Gerson, A. R. *The evolution of surface layers formed during chalcopyrite leaching.* Geochimica et Cosmochimica (in press 2006).

Weber P. A., Thomas J. E., Skinner W. M., and Smart R. St. C. *Calculated acid-base account for H_2O_2 oxidation of carbonate-poor pyritic mine-rock.* Canadian Mineralogist, 43 (4), 1193-1203 (2005).

Weber P.A., Thomas J.E., Skinner W.M. and Smart R. St.C. *A methodology to determine the acid-neutralization capacity of rock samples.* Canadian Mineralogist, 43 (4), 1183 – 1192 (2005).

Weber P.A., Skinner W.M., Thomas J.E., and Smart R. St.C., *Improved acid neutralization capacity assessment of iron carbonates by titration and theoretical calculation.* Applied Geochemistry, 19 (5), 687 -694 (2004).

Weber P.A., Stewart W.A., Skinner W.M., Weisener C.G., Thomas J.E., and Smart, R. St.C., *Geochemical effects of oxidation products and framboidal pyrite oxidation in acid mine drainage prediction techniques.* Applied Geochemistry, 19 (12) 1953-1947 (2004).

Joan E. Thomas, William M. Skinner and Roger St. C. Smart, *A comparison of the dissolution behaviour of troilite with other iron(II) sulfides; implications of structure.* Geochimica et Cosmochimica Acta, 67 (5), 831 – 843 (2003)
Selected for representation in the virtual journal *Experimental Earth*, 1 (1), April 2003

Stewart W., Miller S., Thomas J.E., and Smart R. St C., *Evaluation of the Effects of Organic Matter on the Net Acid Generation (NAG) Test,* Sixth International Conference, Acid Rock Drainage, Proceedings 3/2003. AusIMM, Carlton South, Australia; publications@ausimm.com.au

Thomas J.E., Smart R.St.C. and Skinner W.M., *A mechanism to explain sudden changes in rates and products for pyrrhotite dissolution in acid conditions.* Geochimica et Cosmochimica Acta, 65 (1), 1-12 (2001).

Thomas J.E., Smart R.St.C. and Skinner W.M., *Kinetic Factors for oxidative and non-oxidative dissolution of iron sulfides.* Minerals Engineering, 13 (10-11), 1149-1159 (2000).

Thomas J.E., Jones C.F., Skinner W.M. and Smart R.St.C., *The role of surface sulfur species in the inhibition of pyrrhotite dissolution in acid conditions*. Geochimica et Cosmochimica Acta, 62 (9), 1555-1565 (1998).

Patents

Harmer S.L., Thomas J.E., Esdaile L., Shaw R. and Gerson A.R., *Recovery of Copper from Chalcopyrite.* Patent number: WO03038137. International C22B3/04: C22B3/18. European; C22B3/18; C22B15/00L2A

Conference Presentations

J.E. Thomas, J.E.,. Smart, R.St.C, Weber, P.A., Gerson, A.R., Schumann, R., Levay, G., Stewart, W. and Miller, S.; The importance of understanding possible chemical interactions in the routine testing used to assess the acid producing potential and the acid neutralization potential of soils. *18th World Congress of Soil Science, Philadelphia, Pensilvania, July 9-15 2006.* Accepted as a poster.

Thomas, J.E., Schmidt, R., Kelley, M.J. and Canuel, E.A.; DRIFT Infrared Spectroscopy Studies of Organic Matter Interactions at Mineral surfaces. *18th World Congress of Soil Science, Philadelphia, Pensilvania, July 9-15 2006.* Accepted as a poster.

Gerson A. R. and Thomas J. E. (2006) Acid production from the leaching of pyrite and chalcopyrite. In *Proceeding of the 7th International Conference on Acid Rock Drainage*. March 2006, St. Louis, Missouri, USA. In press.

Surface Reactions of Sulfide Minerals in ARD Assessment, Andrea R. Gerson, Roger St.C. Smart, Joan E. Thomas, Russell Schumann, Warwick Stewart and Stuart Miller, , in "Waste Processing and Recycling in Mineral and Metallurgical Industries V", *Proc. Fifth Int. Symp. Waste Processing and Recycling in Mineral and Metallurgical Industries*, (Eds. S.R. Rao, F.W. Harrison, J.A. Kozinski, L.M. Amaratunga, T.C. Cheng and G.G. Richards), Canadian Inst. Mining, Metallurgy and Petroleum ISBN 1-894475-49-6, pp.509-524 (2004).

Influence and Management of Iron Carbonates and Framboidal Pyrite during ANC Titration Tests, Weber, P.A., Skinner, W.M., Smart, R.St.C., Thomas, J.E*., Proceedings of the Minerals Council of Australia Sustainable Development Conference* (CD ROM), Newcastle 10-15 November (2002), pp. 268-283.

Thomas J.E., Smart R. St C. and A. R. Gerson A. R., Contrasting acid generating behaviour from chalcopyrite and pyrite under highly oxidising and moderately oxidising conditions. *Acid Rock Drainage Sixth International Conference,* Cairns, Australia, 12-18 July 2003. (poster).

Stewart W., Miller S., Thomas J.E., and Smart R. St C., Evaluation of the Effects of Organic Matter on the Net Acid Generation (NAG) Test**,** *Acid Rock Drainage Sixth International Conference,* Cairns, Australia, 12-18 July 2003.

Stewart W., Miller S., Smart R. St.C.; Gerson A.R., Thomas J.E. and Shumann R., Use of the Net Acid Generation (NAG) Test for Evaluating and Quantifying the Acid Generating Capacity of Sulphide Minerals, *Acid Rock Drainage Sixth International Conference*, Cairns, Australia, 12-18 July 2003.

Weber P., Skinner W.M., Smart R. St.C. and Thomas J.E., Influence of reactive iron sulfides and iron bearing carbonates on AMD static and kinetic predictive test work, *Acid Rock Drainage Sixth International Conference,* Cairns, Australia, 12-18 July 2003 (poster).

Thomas J.E., Smart R. St.C., Weber P.A., Schumann R., Miller S. and Stewart W., Methods for the assessment of acid sulphate soils – A summary of relevant findings from AMIRA

project P387A, *5th International Acid Sulfate Soils Conference,* Tweed Heads, Australia, 25-30 August 2002 (poster).

Smart R. St.C., Miller S.D., Thomas J.E., Stewart W.A., Levay G.M. and Skinner W.M., AMD assessment and control: kinetic tests – report on status and applicability, ACMER, *4th Australian Workshop on Acid Mine Drainage*, Townsville, Australia, February-March (2000).

Harmer S., Thomas J.E., Fornasiero D., Smart R. St.C. and A. Gerson., Surface layer control for improved copper recovery for chalcopyrite leaching. *Hydromet 2000*, Adelaide, Australia, April 3-5 (2000).

Thomas J.E., Smart R. St.C. and Skinner W.M., *Kinetic Factors for oxidative and non-oxidative dissolution of iron sulfides.* Hydromet 2000, Adelaide, Australia April 3-5.

International Seminars
Department of Metals and Minerals, University of British Columbia, Vancouver B.C. Canada, February 2000.

Beijing General Research Institute of Mining and Metallurgy, Bejing, China, April 1999 (in association with a private visit).

Publications – Educational Development and Practise

Un-refereed Articles
Thomas J.E., *Making buffers less baffling.* The Australian Science Teachers Journal, 38, 47-48 (1992).

Thomas J.E., *Science and Australian studies*. The Australian Science Teachers Journal, 37, 52-54. (1991).

Thomas J.E., *Keeping the Physical in Bio-Physical Science.* SINE 90, Conference proceedings; Science in Nurse Education, Adelaide (1990).

Conference Presentations
Thomas J. E., *Introduction to molecules- an interactive workshop.* SINE 90, Adelaide (1990).